Integration of Sensor Network to Internet of Things (IoT) for Application of Smart Home using Open Source Computing

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2.   Introduction:

Now days, everything in the world is almost becoming automated. Technology has changed the view through which earlier we used to look at the objects. In the 21st century, we are now opting for more easy options for accessing the technology and day to day objects. The best example is banking where in previous days; the account holder had to go far to the bank and stand in the queue and then transfer or cash the money. But same is now possible on even a basic cell phone where you can transfer the cash, pay the bills very easily not more than five minutes. Similarly booking of railway tickets has also been availed at just one click, where you can book tickets online and pay the fees online rather than standing in the queue and waiting for your turn.

Since these public services are being simplified, the user is now searching a way of making his day to day life and house hold chores more easy and convenient. Imagine what would happen if you were able to monitor your house while wandering around the world, control the appliances of your home just from anywhere in the world, get the update of the house regarding any emergency like fire or burglary at your home. Or when any guest comes unexpectedly to your house and you will be late at your home, then seeing who the guest is and opening the door for him/her from any place.

These all things are known as "Internet of Things (IOT)". These all the flexibilities and possibilities had inspired us to move through this topic and explore more and more possibilities in this project. Especially in India where technology is taking a boom and going through the fastest growth the Country has ever seen. Through this project we are trying to visualize the integration of the smallest possible criteria like monitoring temperature of the home till largest possible of criteria like controlling and setting the Missile defense systems.

3. Problem Statement:

As specified above, from this project, we are trying to simplify the day to day chores of the house and provide it just on one click on the internet. Monitoring the various crucial factors of the home, and providing the flexibility of controlling the home appliances and other factors anywhere from the world as easy as if you were present there. The key features which we are going to include in the current project are as follows:

i. Gas sensor for detection of leakage of Domestic LPG gas:

This sensor will be used for avoiding any kind of fire accident in the home. In India blast in homes due to LPG gas leakage is common reason for the fire in homes. This can be prevented just by adapting this low cost sensor. And if we connect it to our server. We can remotely monitor the Gas leakage, or we can get an alarming message or call indicating the leakage of the Gas thus preventing any major accident.

ii. Sensor for detecting internal temperature of home:

They can be used for detecting fires and generating alarming signal to the home owner. The temperature sensors can be also be used to detect and react in emergency situation, for ex: if the sensor detects rise in temperature above a threshold value, it will automatically trigger the water pump and disengage the fire and also send alarming signal to fire brigade as well as to the home owner.

iii. Automatic A/C (Air conditioner) switching as per temperature as well as user access control through cloud:

This sensor will be most helpful for the working class people who work in their office whole day and just want to jump to the bed after reaching to their home. Through this sensor they can monitor the temperature of the home and then turn on/off the air conditioner and make the suitable temperature at their home while they are still on the way to their home.

iv. Automatic irrigation for domestic garden using soil moisture sensor :

This sensor will decrease the headache of home owners of watering the plants when they are off to the vacation or away due to official work. This sensor will monitor the moisture

level in the soil of the plants and update on the cloud. Now the user can monitor the moisture. When the moisture level decreases, then the user will have the flexibility of turning on the water pump from anywhere in the world using android app or through any computer.

v. Automatic Home Appliances switching via Internet:

It is the major and most important feature of our project. This feature give the house owner to remotely login and control his/her home appliances like TV, Cooler, Lights, Fan etc. One of the most neglected but important factor that people ignore is that, when your out light of the house is off at night, it almost gives a hint to the thief that nobody is at home, when you switch on/off the lights at night and day, it would look like there is somebody living at your home and nobody would dare to break in the house.

vi. Intruder detection and alert:

PIR or Proximity Sensor will be fixed in the house and which will continuously sense the motion in the house. If the sensor senses the unauthorized motion, it will update it on the cloud and send the alarming signal to the home owner and then the owner can see the house through the CCTV camera and if finds any problem can inform the local police.

4. Literature Survey

The survey of literature states that the work on the Things of Internet have been implemented to various area using different technics of communication .
The author Abel Avitesh Chandra , Yeonwoo Lee, Beom Mu Kim, Se Yeong Maeng, Sang Hyeok Park and Seong Ro Lee implemented following key points :

- Storing the data over a cloud and web server
- Making an API in mobile and computer to only monitor the data of the sensors
- Basic Sensors included Temperature, Humidity.

Some other authers have also proposed and implemented following key points:

- Using Zigbee for networking the sensors in the home area
- Creating a HTML5 web based application to control/monitor the parameters
- Ability to control SPDT relay through web based servers
- Extended feature for monitoring temperature, sound, and vibration and pressure
- Using cloud tier for storing the data over the cloud
- Implementing and accessing the data using TCP and UDP protocol over the cloud
- Extra feature added for monitoring the power consumption and supply
- Event notification system using mail

5. Proposed System Architecture:

The system architecture for Smart Home must fulfill the requirements of measuring home conditions, processing instrumented data, and monitoring home appliances. Our approach utilizes microcontroller-enabled sensors for measuring home conditions and microcontroller-enabled actuators for monitoring home appliances in the front end. The whole data will be store on the cloud which can be monitored using mobile phone or through login into web server.
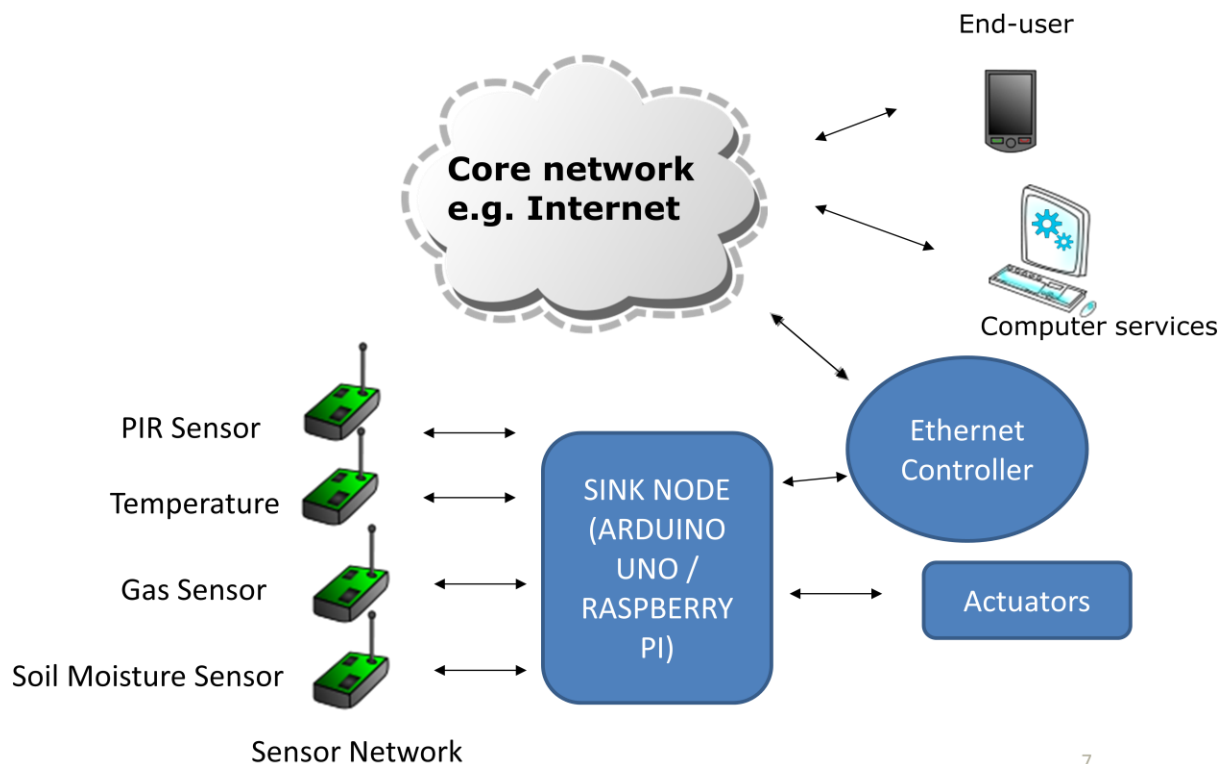
Fig.Block Representation of Proposed Architecture

As mentioned in the above figure, the system comprises of a Raspberry pi (a mini computer)/Arduino Uno which will be kept at home. The sensors we are using are motion sensor, Gas Sensors, Soil Moisture Sensor which will be connected to the Raspberry pi (a mini computer)/Arduino Uno which will update it on the cloud. Various appliances like water pump, Air conditioner will be connected to the Raspberry pi (a mini computer)/Arduino Uno. An Ethernet controller mounted on Raspberry pi (a mini computer)/Arduino Uno will enable the system to get connected through internet and the web server where the data is updated frequently. These whole system could be monitored using Mobile phone and Login Web Server.

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